NEVBD QUARTERLY DIGEST

CONTENTS

NEVBD
NORTHEAST REGIONAL CENTER FOR EXCELLENCE IN VECTOR-BORNE DISEASES

UPCOMING EVENTS & ANNOUNCEMENTS

- Integrated Tick Management Webinar Available Online!
  Visit: http://neregionalvectorcenter.com/online-programs
  (*Stay tuned for continuing education credit program*)
- ASTMH Medical Entomology Pre-Meeting Course: Vector-Borne Disease Risk and Prevention for the Clinician
  October 28, 2018; http://www.astmh.org/annual-meeting/registration
- Applications to NEVBD-sponsored MS in Entomology training program in vector biology & public health due December 1, 2018. Visit
  Visit: http://neregionalvectorcenter.com/ms-in-entomology

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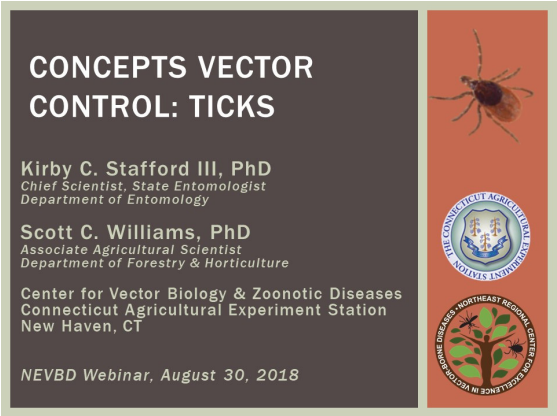
NEVBD ONLINE PROGRAMS

Access Training Programs and Digital Resources through the New NEVBD Online Programs Page!

NEVBD is launching a new resource for the vector-borne disease community in the Northeast: a series of online programming opportunities available through our new **NEVBD Online Programs page**.

NEVBD experts and collaborators are working hard to offer web-based learning opportunities that are responsive to the needs of our community. The first of these opportunities is the **NEVBD Webinar Series, offering no-cost seminars on key vector-borne disease topics and issues impacting the Northeast region**. NEVBD will be offering webinars on a quarterly basis.



The first NEVBD webinar was held August 30, 2018, and featured a seminar and discussion led Dr. Kirby Stafford III and Dr. Scott C. Williams of the Connecticut Agricultural Experiment Station on integrated tick management approaches and challenges. If you did not have a chance to join us for the live webinar, you can access archived materials on our website at **http://neregionalvectorcenter.com/online-programs**.

Have an idea for a NEVBD webinar? Let us know! Send requests for webinar topics to our development team at nevbd@cornell.edu.

What's next in our line up? Expert feedback on the invasive longhorned tick (*Haemaphysalis longicornis*) provided by Dr. Allen Heath. Dr. Heath has extensive experience working with the invasive longhorned tick in New Zealand, which has also experienced an invasion of this livestock pest. **Stay tuned for announcements on date and time for this webinar!**

TRAINING & CAREER RESOURCES

A core mission of NEVBD is to provide access to responsive training programs and foster opportunities for career growth in vector-borne disease professions for our community and partners. We work toward this mission through the creation of training programs for academic and professional audiences. Our Master of Science in Entomology program offers a new, innovative curriculum combining key concepts and competencies of vector biology and public health. Students in this program have access to mentors across our regional network, and gain hands-on experience working in the field through a 10-week internship program. We also offer the Vector Biology Boot Camp - a hands-on short course on key elements of vector surveillance and control available each spring to professionals working in the Northeast region.

In addition to these programs offered directly by NEVBD, **we feature external opportunities for training and career development through our website and weekly e-newsletter**, **NEVBD Weekly Announcements**. These opportunities highlight training programs offered through our partner Regional Centers of Excellence in Vector-Borne Diseases across the US, as well as career opportunities in public health, academic research programs, and fellowships with public agencies. Please visit our External Opportunities page at **http://neregionalvectorcenter.com/external-opportunities** to access the training and career resources offered by our network of partners.

Applications for Fall 2019 admissions to the MS Entomology program are due December 1, 2018.

Visit **neregionalvectorcenter.com/ms-in-entomology** to learn more about the program and how to apply

NEVBD TEAM MEMBER SPOTLIGHT

Meredith VanAcker, MS - PhD Student at Columbia University

Meredith VanAcker is a third-year PhD student in the Diuk-Wasser eco-epidemiology lab at Columbia University's Department of Ecology, Evolution and Environmental Biology. Meredith holds a Master of Science in Environmental Science from Yale's School of Forestry and Environmental Studies, where her research examined the impacts of suburbanization on trematode infections in green frog populations.

For her dissertation, Meredith is researching the emergence of Lyme disease in New York City. She is fascinated by the ways in which the restricted connectivity and habitat availability of urban settings can alter the movement and composition of host communities, as well as the movement of vectors and pathogens. The data collected in New York City will be used in a larger landscape genomics project to characterize corridors and landscape barriers that promote or prevent tick dispersal based on deer host movement.

Meredith VanAcker checking for ticks on a tick drag while conducting field work on Staten Island

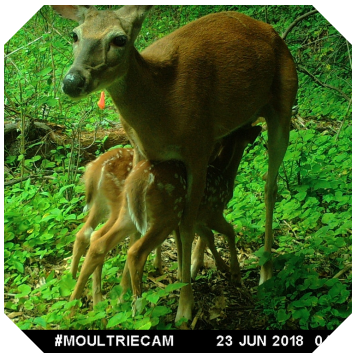
Meredith VanAcker Describes Her Work

Motivation for the project: Locally-acquired Lyme disease cases have been increasing on Staten Island in New York City due to higher deer populations and an abundance of city parks, which provide high-quality habitat for blacklegged ticks infected with various tick-borne pathogens. Staten Island city parks provide suitable habitat for ticks infected with various tick-borne pathogens. These parks are often isolated within areas of high development, which can restrict the movement of deer and the distribution of blacklegged ticks (*Ixodes scapularis*).

What we hope to understand: Through my fieldwork, I am seeking to understand how the abundance and distribution of infected blacklegged tick nymphs in the urban landscape is affected by deer movement, host diversity, and by the pathogen prevalence and population dynamics of white-footed mice (*Peromyscus leucopus*).

How we are doing it: We have eight sites in city parks distributed across Staten Island where we are conducting small mammal trapping, surveying the larger mammal host community with camera traps, and monitoring blacklegged tick densities through tick dragging.

What the data can tell us: The urbanization process can affect the composition of host communities by making the habitat particularly suitable for a small number of species that are adapted to the urban environment. There is little existing data on tick host communities in this landscape. We are using camera traps to survey the diversity of the host community in Staten Island parks to understand the relative proportion of hosts other than white-footed mice available to blacklegged ticks. The data acquired through the summer fieldwork will be integrated with GPS collar data from the Staten Island deer population to examine the relationship between deer habitat usage and movement, and the densities of blacklegged ticks. The tick densities at each of these sites will help us understand the level of connectivity for deer moving between major regions of Staten Island's green spaces. The infection prevalence of white-footed mice with the bacterial agent for Lyme disease is unknown on Staten Island, and this will provide critical baseline information on the pathogen's range. Together, these data will provide insight into the most appropriate areas for intervention and tick control.



Deer family caught on camera trap in Staten Island park

MOSQUITO SURVEILLANCE FOR THE PREVENTION & CONTROL OF EMERGING MOSQUITO-BORNE DISEASES

BY PHILIP ARMSTRONG, ScD, and THEODORE ANDREADIS, PhD, CONNECTICUT AGRICULTURAL EXPERIMENT STATION

Role of Mosquito Surveillance in Public Health

Mosquito surveillance for mosquito-borne viral diseases is essential to the public health response to these threats. Mosquito activity and risk of human disease change each year with variable weather conditions and other factors that are not fully understood.

Aims of Mosquito-Based Surveillance:

- Gather early evidence of local virus activity
- Provide information on the abundance, distribution, identity and infection rates of potential mosquito vectors
- Produce information on the risk of human infection to warn the public and guide the use of disease prevention and control measures

(from left to right) Placement of CDC light trap for mosquito sampling; Identification of field-collected mosquitoes; Testing mosquito samples for presence of arboviruses

Viruses carried and transmitted by mosquitoes are an annual threat to human health in the northeastern US. Both West Nile virus (WNV) and eastern equine encephalitis virus (EEEV) occur in this region and can cause life-threatening disease of the nervous system, including encephalitis and meningitis.

WNV has become the main cause of mosquito-borne illness in the Northeast since it was first introduced into the NYC area in 1999. In contrast, EEEV activity occurs less often, but the disease is more deadly to humans. The human fatality rate for EEE is about 40%, and roughly half of survivors suffer long-term neurological damage. There are no vaccines to prevent infection with these viruses or medications to treat illness in people.

Drier and hotter summers tend to favor WNV activity and wet years favor EEEV. However, episodes of heavy rainfall in any given year typically cause surges in mosquito populations that can impact virus transmission with unpredictable consequences. A comprehensive surveillance program, accompanied by science-based controls and timely public outreach, are the most effective ways to protect the public and reduce the risk of human disease. Moreover, a comprehensive surveillance program can provide a first line of defense against the introduction of exotic mosquito pests and mosquito-borne pathogens, such as dengue, chikungunya, and Zika viruses, through early detection of these potential threats.

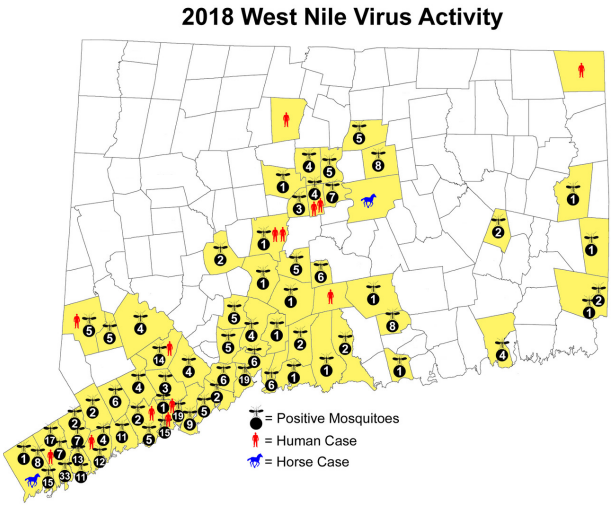
State Snapshot: Mosquito Trapping Program in Connecticut

The Connecticut Agricultural Experiment Station (CAES), under the direction of Dr. Philip Armstrong, operates a network of 91 fixed mosquito-trapping stations located in 72 municipalities statewide from June through the end of October of each year. CAES uses CO2-baited CDC light traps that capture a diversity of mosquito species, and gravid mosquito traps that target mainly *Culex* species (the principal vectors of WNV). Traps are placed in the field in the afternoon, operated overnight, and retrieved the following morning. Adult mosquitoes are transported alive to the laboratory and identified to species. CAES staff pool female mosquitoes in groups of 50 by species, trap type, date and location. Each mosquito pool is tested for evidence of WNV, EEEV, and other mosquito-borne viruses of public health importance. Test results are reported to the CDC, the Connecticut Department of Health (CT DPH), and other state agencies, local health departments, the media, and neighboring states.

West Nile virus has emerged as a significant health threat in Connecticut during 2018. As of September 26, 2018, CAES has detected higher than normal levels of WNV-infected mosquitoes in 65 sites located in 53 municipalities. The majority of WNV activity was detected in densely populated urban and suburban regions in Fairfield, Hartford and New Haven counties, consistent with prior years. Fourteen human cases of WNV encephalitis were locally acquired, and additional cases are likely to occur before the mosquito season ends with the first killing frost this fall. CAES works closely with the CT DPH and other state and local agencies to coordinate messaging and public outreach efforts, and to review options for mosquito control.

The health threat posed by WNV and EEEV is similar in several Northeast states this year. **You can follow the links at the bottom of this page to access mosquito surveillance reports for your area**, or contact your state health department to learn more.

Map of Connecticut West Nile virus Activity as of Sept. 26, 2018



NEVBD Applied Research to Enhance Mosquito Surveillance Programs

CAES continues to closely monitor the expansion of two exotic mosquito species from Asia: the Asian tiger mosquito (*Aedes albopictus*) and the Asian rock pool or bush mosquito (*Aedes japonicus*), which are aggressive human biters and have been implicated in the transmission of several human pathogens, including dengue virus, chikungunya virus, LaCrosse virus (LACV), and WNV. CAES Postdoctoral Scientist Dr. Gillian Eastwood, under the direction of Dr. Theodore Andreadis and Dr. Philip Armstrong, is **evaluating different mosquito trap lures to improve collections of mosquitoes that are poorly captured by standard trapping methods**. The research goal is to significantly improve traps to collect the most important mosquito vectors in the Northeast. Preliminary results of this work show that two new lure formulations are superior for attracting the invasive species *Aedes japonicus*, as well as the main vector for LACV, *Aedes triseriatus*, when compared to conventional, commercially-available trap lures. Additional evaluations are ongoing to test these new trap lures in locations where the invasive species *Aedes albopictus* occurs.

Historically, LACV is rarely detected in Connecticut, but there are suspicions that the vector species is systematically under-sampled by conventional trapping methods. **Dr. Eastwood's use of the new mosquito trap lures has enhanced collections of *Ae. triseriatus*, and testing of these collections indicates that the entomological risk of LACV is much higher in Connecticut than previously thought.**

Statewide Surveillance Programs in the Northeast

- Connecticut: http://www.ct.gov/caes/mosquitotesting
- Delaware: http://www.dnrec.delaware.gov/fw/mosquito
- District of Columbia: https://dchealth.dc.gov/page/mosquito-borne-diseases
- Maine: https://www.maine.gov/dhhs/mecdc/infectious-disease/epi/vector-borne/arboviral-surveillance.shtml
- Maryland: https://phpa.health.maryland.gov/OIDEOR/CZVBD/pages/Data-and-Statistics.aspx
- Massachusetts: http://www.mosquitoresults.com/
- New Hampshire: https://www.dhhs.nh.gov/dphs/cdcs/arboviral/results.htm
- New Jersey: http://vectorbio.rutgers.edu/reports/vector/
- New York: https://www.health.ny.gov/diseases/west_nile_virus/
- Pennsylvania: http://www.westnile.state.pa.us/surv.htm
- Rhode Island: http://www.health.ri.gov/data/arboviralsurveillance/
- Vermont: http://www.healthvermont.gov/disease-control/mosquito-borne-diseases/mosquitoes-vermont
- Virginia: http://www.vdh.virginia.gov/environmental-epidemiology/bugs-human-health/
- West Virginia: https://dhhr.wv.gov/oeps/disease/Zoonosis/Mosquito/Pages/default.aspx

Aedes triseriatus mosquito (Photo credit CAES)

Aedes albopictus mosquito (Photo credit CAES)

Aedes japonicus mosquito (Photo credit CAES)

MEET THE TICKBORNE DISEASE PREVENTION LAB!

at the Department of Biological & Environmental Sciences, Western Connecticut State University

BY NEETA CONNALLY, PhD, and RAYDA KRELL, PhD

WCSU Tickborne Disease Prevention Laboratory: What Do We Do?

Researchers at the **Tickborne Disease Prevention Laboratory** at Western Connecticut State University study the prevention of blacklegged tick-associated diseases in the northeastern United States. Specifically, our team is most interested in **reducing tick bites in the suburban backyard landscape**, at the intersection of tick ecology and human behavior.

Laboratory research projects, directed by medical entomologist Dr. Neeta Connally, have included studies aimed at:

- Evaluating tick-repellent clothing
- Determining effectiveness of backyard tick control strategies for preventing human disease
- Investigating where humans encounter ticks
- Assessing barriers to human-adoption of tick bite prevention measures.

WCSU is a primarily undergraduate-serving institution and students often play key roles in tickborne disease prevention research. More than 30 undergraduate students have completed seasonal internships in the Tickborne Disease Prevention Laboratory since 2011, including a recent WCSU graduate who detected Connecticut's first exotic longhorned tick specimen during routine tick monitoring activities.

Weighing bait boxes for the Backyard Integrated Tick Management Study (Photo credit Peggy Stewart)

Student intern Brittany Schappach, dragging for ticks at one of our Fairfield County, CT, weekly tick monitoring sites (Photo credit Peggy Stewart)

Current Projects

In 2016, Dr. Connally received a CDC cooperative agreement to launch the **Backyard Integrated Tick Management Study**, in collaboration with Dr. Thomas Mather at the University of Rhode Island. The four-year, placebo-controlled prospective study aims to assess an **integrated strategy for tick management and disease prevention** that includes the residential application of a single acaricide spray combined wtih rodent-targeted bait boxes. The study also evaluates the effectiveness of applying these tactics to contiguous vs. single properties, and uses human surveys to better understand how humans use their backyard landscape and other outdoor spaces. The study is in its third year and has enrolled more than 130 homes from Lyme-endemic communities in western Connecticut and southern Rhode Island.

Backyard Integrated Tick Management Study coordinator, Dr. Rayda Krell, with Connally, ready for field work (Photo credit Sandra Zapata-Ramirez)

The WCSU Tickborne Disease Prevention Laboratory also recently partnered with the **BLAST Tickborne Disease Prevention Program** on a effort to improve prevention education for New England families. The project titled, "Spray Safe, Play Safe: Promoting Integrated Tick Management for Preventing Lyme Disease in Children," was funded by a Healthy Communities Grant from the U.S. Environmental Protection Agency, and seeks to **teach families about safe, effective, and sensible use of acaricides for backyard tick management**. Recognizing the challenges in communicating prevention information to the public, project partners are creating short, educational videos that use engaging stories to deliver family-oriented, science-based information to homeowners. The videos will be released in mid-April 2019.

Ridgefield CT First Selectman Rudy Marconi, "Fran Tick," and Connally – filming on location for the EPA funded Spray Safe, Play Safe project (Photo credit Peggy Stewart)

Learn more by visiting http://www.wcsuticklab.com/

Longhorned Tick

Haemaphysalis longicornis

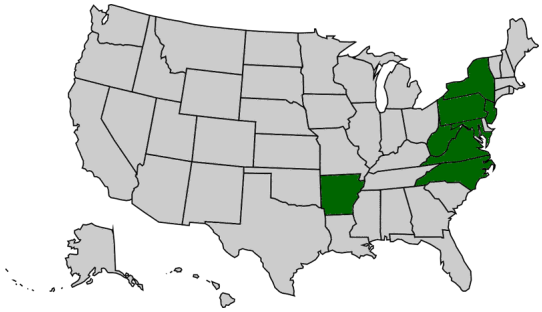
(Left to right) Haemaphysalis longicornis adult, nymph and larva (Photo credit Manigandan Lejeune, Cornell Animal Health Diagnostic Center)

The **longhorned tick** is an **invasive species** to the United States. This tick was first discovered on a farm in New Jersey in 2017, and is now known to have been here since at least 2010. This tick has three life stages - larva, nymph, adult - which each feed off of a different host, making the longhorned tick a 3-host tick.

Where do they live?

This tick is native to eastern Asia, and is an invasive pest to New Zealand and Australia. The longhorned tick can often be found in meadows and grassy areas near forests.

As of September 2018, this tick has been identified in the US in Arkansas, Maryland, New Jersey, New York, North Carolina, Pennsylvania, Virginia, and West Virginia.



States with documentation of Haemaphysalis longicornis as of September 28, 2018

What are their primary hosts?

Longhorned ticks feed off of a wide variety of host animals, including birds and mammals, including humans. The longhorned tick is a **major livestock pest**, and is often found on cattle, sheep, and other livestock.

Are they harmful?

This tick can cause anemia to cattle and sheep and reduce dairy production in cows when found in high numbers. In other parts of the world, this tick can transmit bovine theileriosis and babesiosis infection in animals. Researchers and public officials have not detected pathogens in ticks tested from the US. However, we still need to know more about how this tick behaves and whether it is capable of transmitting local pathogens of concern to us here in the US.

How can I avoid this tick?

The same personal protection strategies used to avoid our native ticks work for the longhorned tick. Remember to wear repellent, check yourself for ticks frequently, and try to shower within 2 hours after being outside in an area where the tick lives.

Farmers and livestock owners should contact their veterinarian to discuss tick management strategies. **If longhorned ticks are suspected, farmers should consult their veterinarians and contact their state Department of Agriculture**.

Resources to learn more:

NEVBD Longhorned Tick Resources: http://neregionalvectorcenter.com/longhorned-tick

Rutgers Center for Vector Biology: http://vectorbio.rutgers.edu/outreach/ticknews.php

Pennsylvania State Extension: https://extension.psu.edu/asian-longhorned-tick-haemaphysalis-longicornis